In conclusion, I may say that postoperative x-ray treatment of malignant disease is indicated because in every attempt to remove surgically a malignant growth the chances are that cells of the growth have been left in the tissues, and also because we have in the x-rays an agent that in a large proportion of the cases will completely destroy these cells. It, therefore, becomes our duty to give the patient the increased chances of a permanent cure.

THE DIFFERENTIATION OF COMMON TYPES OF PROTRACTED FEVER.

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The anxiety aroused by the presence in a patient of a continued fever for which we can find no adequate cause is well known. Of recent years a number of interesting and instructive cases of this character have come under observation in the Presbyterian Hospital, and a review of them may prove of value. We may classify these cases under the following heads: (1) Typhoid fever, (2) tuberculosis, (3) septicemia, (4) influenza, and (5) unexplained fever. The absence of malaria from this list may be thought remarkable, but it is now established beyond question that in this latitude malaria can easily be recognized by the examination of the blood and the use of quinine. A fever which shows no parasites in the blood and does not yield to quinine is not malaria. We have therefore no longer any difficulty from that source.

1. Typhoid Fever. Protracted cases of typhoid fever are not uncommon. McCrea gives the average duration of the primary attack as twenty-nine days, but it may well be prolonged to forty or fifty days. We have in our records one case of sixty days, and longer cases are reported. Such prolongation of the fever always gives rise to anxiety, although, as a rule, if the fever is the chief consideration we may be confident of a favorable outcome. The greatest cause of anxiety in these cases is usually that of diagnosis. As the fever is protracted beyond its usual limits we begin to question whether the diagnosis is certain, whether we may not be dealing with some other disease, such as tuberculosis or septicemia. In the days when we were forced to rely wholly upon bedside observation this uncertainty often gave rise to great anxiety. The aids brought to our assistance by the clinical laboratory have naturally lessened our difficulties. By means of the diazo reaction, the leukocyte count, the Widal reaction, and blood cultures, the diagnosis of typhoid fever can now

be established with such certainty that there is rarely ground for doubt. We sometimes fall into error by persisting in regarding a case as typhoid fever despite the negative evidence of these various tests. If in any case believed to be typhoid fever we have not by the end of the third week obtained satisfactory evidence, from clinical observations and laboratory tests, of the correctness of that diagnosis, we had best seriously review it.

The question naturally arises, What is satisfactory evidence of typhoid fever in the cases of protracted fever of which we are speaking? The enlargement of the spleen so often made much of belongs also to the diseases with which typhoid fever is most likely to be confused—tuberculosis and septicemia. It is perhaps more frequent in typhoid than in either of the other fevers, but not sufficiently so to render its presence of definite value. We may say the same of the abdominal symptoms—distention, tympanites, diarrhœa. In short, on the clinical side the symptom of most help is the typhoid roseola. In the Johns Hopkins cases of typhoid the eruption was found in 93 per cent. of the white patients, in 55 per cent. of the black. Taken in conjunction with other symptoms suggestive of typhoid it may be safely accepted as determining the diagnosis. The characteristic rash consists of small, round, discrete, rose-colored spots, varying from 2 to 4 mm. in diameter, disappearing on pressure either flat or sufficiently raised to be definitely felt above the surface, developing in successive crops on the abdomen, chest, or back. They usually appear during the second week, but it is to be remembered that they may not appear until much later—in some cases not until the fever has subsided. The bright color of the spots seen on their appearance fades gradually in three to five days, leaving possibly a slight brownish pigmentation. The typhoid spots never become vesicles or pustules and are never acuminate. They are therefore easily distinguished, as a rule, from chance eruptions of acne, miliaria, and the like. No such spots are seen in the other fevers here under consideration. The only prolonged fever in which spots not easily distinguished from those of typhoid fever do occur is trichinosis, but this affection is readily recognized by other features, especially the œdema of the face, pains, leukocytosis, and eosinophilia.

Of the laboratory tests, the diazo reaction is of slight value. It is more frequent in typhoid than in other fevers, but not sufficiently so to render its presence more than suggestive. A persistently low leukocyte count, with or without a relative lymphocytosis, belongs to typhoid fever and tuberculosis. The Widal reaction, if obtained repeatedly by a qualified observer, ought to be pathognomonic. Its continued presence in a doubtful case is regularly decisive. While we know that the reaction may be absent in some cases, we also know that it is found at some period of the fever in 95 per cent. of the cases in which it is carefully sought. Its value in a case of doubtful protracted fever is therefore great.

The demonstration of typhoid bacilli in the blood is, of course, conclusive. Equal importance attaches to the demonstration of the bacilli in the urine or cerebrospinal fluid, or even in the feces. The cultivation of the bacilli from any of these sources is, however, attended with considerable practical difficulty. When one has access to a first-class laboratory and an experienced bacteriologist, these procedures may clear up a case which would otherwise remain a puzzle.

The following case well illustrates the difficulties of diagnosis even when every resource at our command is employed, and the value of the Widal reaction and blood cultures when positive results are obtained:

CASE I.—M. B., aged forty-six years; a housewife. She had had a chronic endocarditis for some years, and was treated in the Presbyterian Hospital from April 3 to May 12, 1907, for lobar pneumonia and chronic endocarditis. She was readmitted on September 27 on account of an increase in her symptoms of cardiac failure. Under treatment her condition improved. The temperature was practically normal until October 20, when she had a chill and a sudden rise to 104°. At this time the pulse, previously ranging from 60 to 80, rose to 96 to 108, and her dyspnœa was somewhat increased. Nothing in the physical examination at this time explained the chill and fever. For two days following the chill the temperature was moderately high, 101° to 103°, then it rose again, and remained from 102° to 105° for many weeks. The pulse remained rather slow in proportion to the fever. The spleen became enlarged so that it was easily palpable. The abdomen was distended and tympanitic. The bowels were constipated. At times the patient's mind was rather dull, but not remarkably so. She sweated profusely. The diagnosis lay between typhoid fever (acquired in the ward) and an added infection of the endocardium (malignant endocarditis). For five weeks there was no material change in the conditions. During this period the urine regularly gave the diazo reaction of Ehrlich; the leukocyte count ranged from 10,000 to 12,000, but on one occasion sank to 6000. Repeatedly trials of the Widal reaction resulted negatively, and two blood cultures gave no growth. Neither the characteristic roseola of typhoid nor the petechial rash of malignant endocarditis appeared. On the whole, the clinical course seemed to favor the diagnosis of typhoid fever, but the rarity of typhoid infections in the hospital and the absence of conclusive evidences of typhoid kept us in doubt. On the other hand, the suddenness of the onset and a certain intensification of the signs of the chronic endocarditis strongly suggested the possibility of malignant endocarditis, and none of the findings were conclusively against that diagnosis. On the thirty-seventh day of the fever the Widal reaction was obtained, and this finding was confirmed three days later, while a blood culture taken on the thirty-sixth day gave a growth of the typhoid bacillus. The patient finally succumbed in the ninth week of the fever, and the autopsy confirmed the diagnosis thus tardily established.

The further consideration of the differential diagnosis will be taken up in connection with the discussion of the types of protracted fever.

2. TUBERCULOSIS. The tuberculosis which belongs to our subject is the acute miliary form, of which there are two fairly distinct types: (1) The typhoid, and (2) the pulmonary. A summary of two cases illustrating these types follows:

CASE II.—H. G., aged twenty-seven years; admitted June 23, 1904; died August 3, 1904.

History. Family: Negative. Personal: Negative. Previous: Pleurisy five years ago for one week. Gonorrhœa one and one-half years ago. Present: For two weeks easily tired and lacking in energy; nine days in bed on account of headache, backache, and fever. He has felt better, but remained in bed on orders. On admission, temperature, 104°; pulse, 72; respirations, 20. Physical examination at this time entirely negative.

Course. Continued fever, from normal to 105°, eight weeks in all. Usually from 100° to 102° to 103°. Pulse from 72 to 100, more rapid and feeble at end. Respirations, 20 to 28. Loss of flesh and strength, exhaustion, moderate anemia.

Physical Signs. Spleen became palpable. No distention or tenderness of abdomen. No eruption. Signs of a slight general bronchitis.

Laboratory Tests. No Widal; no diazo; blood cultures negative. Cultures from feces, no typhoid. Sputum always negative, rarely obtained. Urine negative.

BLOOD EXAMINATIONS.

	June 23	June 29	July 6	July 7	July 17	July 19	July 22	July 26
Hemoglobin	......	......	......	50.0%				
Red cells	......	......	......	4,136,000				
Index	......	......	......	0.61				
Leukocytes	6000	5200	4000	5000	4300	3600	7300	4300
Polynuclears	......	......	......	80.0%	......	......	......	97.0%
Large mononuclears	......	......	......	1.0%				
Small mononuclears	......	......	......	18.0%	......	......	......	3.0%
Eosinophiles	......	......	......	1.0%				

Autopsy. Acute general miliary tuberculosis.

It is to be noted that in this case we found the leukopenia regarded as characteristic, but the differential counts showed in one instance a definite increase of the polynuclear leukocytes, and in the other an overwhelming predominance of these cells.

Case III—L. S., aged twenty years; admitted April 3, died June 24, 1906.

History. Family: Good. Personal: British Guiana until six months ago, when she came to New York; otherwise negative. Previous: Measles, whooping-cough, dysentery in childhood; dyspepsia for six months. Present: For one week not well, "caught cold," tired and easily fatigued; two days ago a chill, headache, and fever; the same afternoon a second chill; in bed since onset; complains only of fever, headache, prostration, anorexia, and constipation. On admission, temperature, 102°; pulse, 102; respirations, 20.

Course. Continuous fever, 100°, 102°, and 103°, rather irregular in type. Fever in all lasted three months. Pulse rather rapid, 80 to 100 to 120. Respirations, 20 to 30; in last weeks 30 to 40. Gradual loss of flesh and strength and increasing anemia. Always comfortable and cheerful.

Physical Examination. Entirely negative at beginning, except palpable spleen. April 30, by Dr. Baldwin, of Saranac, no pulmonary lesion. June 14, signs of a general bronchitis.

Ophthalmoscopic examination by Dr. Parker: one small area in right eye suggestive of miliary tubercle.

In final weeks occasional cyanosis of fingers and lips, gradually deepening and becoming continuous.

Laboratory Tests. Widal always negative; blood cultures negative; feces cultures negative. No malarial organisms in blood. Urine: 1015 to 1025, albumin, faint trace, rarely casts, no pus. Diazo reaction repeatedly positive.

Blood Examinations.

	Hemoglobin. Per cent.	Red cells.	Index. Per cent.	White cells.	Polynuclears. Per cent.	Transitionals. Per cent.	Large mononuclears. Per cent.	Small mononuclears. Per cent.	Basophiles. Per cent.	Eosinophiles. Per cent.
April 3 . .	78	6,024,000	0.68	8,100	82.0	0.5	2.0	15.5		
April 4 . .	...	....	.....	9,600	61.0	5.5	0.5	23.5	......	6.5
April 7 . .	...	....	......	......	82.0	......	10.4	6.0	0.4	1.2
April 21 . .	76	....	......	13,800	84.5	1.0	3.0	10.5	0.5	0.5
May 6 . .	77	....	......	16,100						
May 8 . .	...	....	......	16,300						
May 10 . .	...	....	.....	......	72.0	3.0	8.0	14.0	......	2.5
May 12 . .	...	....	......	.....	74.5	1.5	11.5	16.5	......	2.5
May 22 . .	...	....	......	10,500	82.0	4.0	2.0	7.0	......	5.0
June 8 . .	69	4,704,000	0.73							
June 22 . .	...	....	......	19,000						

Autopsy. Acute general miliary tuberculosis, the lungs crowded full of miliary tubercles.

Special attention is called to the variability of the leukocyte count, both absolute and differential. Out of seven counts, only one, that of April 4, gave what is commonly stated to be the characteristic blood picture of acute miliary tuberculosis, an absence of leukocytosis, with an increase in the proportion of lymphocytes. The rapid variation of the differential counts indicates the need of great caution in interpreting the meaning of any one of them. The most careful examination of the lungs as late as April 30, more than a month after the onset, gave no signs, although at that time there must have been large numbers of miliary tubercles in the lungs.

The resemblance of the first type of acute miliary tuberculosis to typhoid fever is so close that for weeks a differential diagnosis is usually impossible. They have in common the fever, prostration, gradual emaciation, and slowly increasing anemia. Each shows an absence of leukocytosis, or leucopenia, with usually an increase in the percentage of lymphocytes. Either may give the diazo reaction. Either may show moderate enlargement of the spleen. Either may have tympanites and diarrhœa. Miliary tuberculosis with intestinal lesions (ulcers) may even show blood in the stools. Either may give a Widal reaction. The resemblance is so close that in some cases a decision between them must be left to the autopsy.

In most cases, however, we can by care anticipate the conclusion. Acute miliary tuberculosis of this type looks like mild typhoid fever, but it may be distinguished by these points:

1. A previous tuberculosis of any part of the body.

2. The fever of miliary tuberculosis is more irregular than that of typhoid. It shows a greater daily variation: it may be low all of one day, to rise again the next; it more frequently shows sudden brief drops to normal or below with quick recovery.

3. When a typhoid fever of similar severity would be improving, the patient with miliary tuberculosis is stationary or still failing. Thus, at the end of the third or fourth week the temperature, instead of falling, continues or runs a higher course.

4. Hemorrhage from the bowels in any degree, although it may occur, is most uncommon in tuberculosis.

5. Of the decisive features of typhoid fever mentioned above, the roseola, the typhoid bacillus in the blood or excreta are absent.

6. The possibility of the occurrence of a Widal reaction in tuberculosis, especially the acute miliary form, must be admitted. The reaction in these cases, while not altogether typical, so closely resembles that obtained in typhoid that even the most skilled observers find difficulty in distinguishing them, and the inexperienced may see no difference. It still remains true that the repeated finding of the Widal reaction is more characteristic of typhoid than of tuberculosis.[1]

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[1] Wood, Chemical and Microscopic Diagnosis, p. 236

The second (pulmonary) type of acute miliary tuberculosis is much like the preceding, and presents the same difficulty of diagnosis for weeks. The careful observation will regularly disclose some important points:

1. Attacks or periods of cyanosis of the lips (and other mucous membranes) and the finger tips. This cyanosis is at first slight and variable, quite definite at one time, then disappearing entirely for a time. It is not caused by any ascertainable disturbance of the circulation; the pulse remains the same. It is free from any distress on the part of the patient—in fact, the comfort of the patient, despite the definite cyanosis, is quite notable.
2. The signs of diffuse bronchitis, which belong to typhoid fever and tuberculosis in the early stages, instead of gradually clearing up as they should in typhoid, gradually increase. The expansion of the chest and its resonance are slowly and insidiously impaired, yet without definite areas of consolidation. It is often amazing at autopsy to find a lung packed with miliary tubercles, which have given no pronounced signs during life.
3. The periods of cyanosis become more frequent and longer until the symptom becomes continuous. The respiration quickens gradually, but to the end there is no real dyspnœa or distress.
4. The cough is always much less than the signs would lend us to expect, and may be absent even to the end. Similarly, expectoration most often is lacking, and even when present does not show bacilli.

In connection with this question of the diagnosis of tuberculosis mention may here be made of the test reactions of von Pirquet and Calmette. For some reason not yet satisfactorily explained both these reactions fail in acute miliary tuberculosis, so that they are not of value in the cases we are at present discussing.

3. CRYPTOGENIC SEPTICEMIA. The third common cause of protracted fever, and in our experience much the most frequent one, is cryptogenic septicemia. When we have to do with fever in association with suppurating wounds, an infected uterus, large abscesses, etc., the explanation of the fever is, of course, easy. In the group of cases to be here considered, however, the origin of the septicemia is not revealed and the search for it is often futile.

The cases which belong in this group may be readily classified. (1) Blood infections; malignant endocarditis; pyogenic organisms found in blood. (2) Local infections; latent; no organisms in blood; symptoms produced by absorption of toxins from some hidden focus of suppuration, which finally develops into a localized abscess, such as abscess of the liver, perinephritic abscess, or empyema.

The following abstracts of cases illustrate these different types:

CASE IV.—*Malignant Endocarditis.* F. M., aged eleven years; admitted September 25, 1907; died October 1, 1907.

Previous history of chorea and rheumatism, pneumonia, and measles. Present history: For ten days before admission she had

had fever and headache and had occasionally been delirious. On her admission her temperature was 103.8°; pulse, 120; respirations, 48.

The physical examination at this time showed marked apathy and prostration, a coated tongue, an enlarged heart with systolic murmurs at the base and apex, a rapid pulse, but of good quantity, the abdomen distended and tympanitic, and an enlarged and palpable spleen.

The leukocytes on admission were 15,200. The clinical diagnosis at this time was typhoid fever. During the following six days the temperature was continuously high, ranging from 102° to 105°, the curve being altogether like that of most severe typhoid fever. The pulse grew steadily more rapid and weaker and the apathy and prostration deepened. In a general way the course was that of severe typhoid. But on the 29th, four days after admission, the leukocytes were found to number 31,500 and a differential count showed 87 per cent. polynuclears, 1 per cent. transitionals, and the mononuclears, large and small, only 12 per cent. On the same night a number of petechial spots appeared on the chest and side of the neck. Later, paralysis of the right side developed. The cardiac signs became more pronounced. Finally, a blood culture taken three days after admission showed abundant growths of staphylococci.

The rise in the leukocyte count on the 29th showed that the case was not uncomplicated typhoid fever, while the rapid evolution of the petechial eruption and subsequent paralysis indicated clearly a malignant endocarditis. The result of the bood culture confirmed this diagnosis.

CASE V.—S. M., aged nineteen years; factory hand; admitted November 9, 1905; died June 21, 1906.

History. Family: Negative. Previous: Heavy lifting in room at high temperature. Malaria two years ago. Present: For four months feeling poorly. Hands and feet cold and chilly sensations at times. He had no dyspnœa, œdema, or shortness of breath. Bowels constipated. No nausea or vomiting. As he did not improve, he went to a physician, who told him he had heart trouble and that he had better stop work and take a rest. Since then he has been getting up late in the morning, and has rested much during the day, but without benefit. His chilly feelings continue. He has palpitation when he attempts to get about, and is occasionally dizzy. No dyspnœa; marked anorexia, but no nausea or vomiting. No nose bleed or headache. Stools normal. All this time he has had fever and sweated a good deal at nights.

Physical Examination. Heart: Apex impulse maximum in fourth space two and three-quarter inches to left of midline, and in fifth space three inches to left of midline. Left limit of dulness corresponds. No enlargement made out. Action regular, forcible, not rapid. At the apex there is a soft blowing systolic murmur transmitted to the axilla and heard behind, and also over whole precordium, being more accentuated over the pulmonic area. Basal sounds are clear, the second pulmonic being the louder.

Pulse regular, a little rapid, good force and size, soft, wall palpable, markedly dicrotic, marked pulsation of arteries in neck. Examination otherwise negative.

Course. During the seven months of his stay in the hospital this patient had more or less daily fever. At times the fever would be slight, but usually the temperature at some time of the day would reach 101° to 103° or 104°. During the early weeks the fever was continuous; later it become irregular and much of the time intermittent in type. The more important features of the daily notes are given below. The condition of the heart remained throughout practically the same. The patient's friends finally insisted upon removing him from the hospital, and the later history is not known.

BLOOD EXAMINATIONS.

	Hemoglobin. Per cent.	Red cells.	Leukocytes.	Polynuclears. Per cent.	Large mononuclears. Per cent.	Small mononuclears. Per cent.	Transitionals. Per cent.	Eosinophiles. Per cent.	Basophiles. Per cent.
November 9 . . .	55	3,200,000	6,200						
November 10 . . .	...	....	12,000						
November 20 . . .	...	....	8,700						
November 28 . . .	...	....	10,000						
December 22 . . .	72	3,840,000	19,000	76.0	7.5	12.5	2.5	1.5	
December 29 . . .	...	....	12,100						
January 2	50	3,272,000	13,200	76.0	7.0	14.0	2.5	0.5	
January 9	...	....	8,100	84.5	2.5	11 0	1.5	0.5	
January 15 . . .	...	....	......	77.5	4.0	14.5	3.0	1.0	
January 24 . . .	...	....	10,300						
February 12 . . .	...	....	16,100	76.5	2.0	11.0	5.0	0.5	
March 6	...	....	14,300						
March 30	...	....	19,600	90.0	0.5	6.5	2.5	0.5	
April 16	...	....	8,800	71.0	0.5	19.5	7.0	1.5	0.5
April 24	...	....	22,400						
May 22	...	....	9,400						
June 16	...	....	11,800	89.0	0.5	5.0	5.5		

November 25, a systolic thrill at apex. November 29, spleen palpable. December 1, pain in left hypochondrium; spleen large. December 15, a few petechial spots on abdomen. January 1, murmurs same. January 2, a few new petechial spots. January 15, more petechiæ on chest and back. January 22, severe abdominal pain; heart same. January 26, pain in left shoulder. February 14, from time to time new petechiæ appear. March 1, red blood cells in urine and tenderness over left kidney. March 14, temperature normal for several days. March 30, temperature not above 100° for two weeks. April 9, temperature not above 100° for two weeks. May 16, temperature shows occasional shoots to 102°. June 7, fever irregular; some burning pain on micturition and blood in urine.

A blood culture on November 28 was negative; a second, on December 22, yielded a pure growth of Staphylococcus pyogenes aureus.

Urine, 30 to 70 ounces; average, 50 ounces; specific gravity, 1015 to 1020; albumin, trace, to 24 to 31 per cent.; hyaline and granular casts; rarely blood and blood casts.

Comparison of the results of the blood counts, especially the absolute and differential leukocyte counts, with those of the second case of acute miliary tuberculosis shows that the only notable difference lies in the more marked reduction of hemoglobin in the latter case. The leukocyte counts show closely similar variations both in totals and in the distribution of the several types.

CASE VI.—*Perinephritic Abscess.* J. M., aged twenty-three years; iron worker; admitted June 3, 1907; transferred June 18, 1907.

History. Family, previous, and personal irrelevant. Present: For three months complaining of bloating and pain in the abdomen, the latter not related to taking of food. For three weeks more or less vomiting of mucus. At one time he vomited a small quantity of blood. He has some pain low in the left side on deep breathing. On admission, temperature, 101.2°; pulse, 92; respirations, 21.

Physical examination at this time elicited nothing of importance. The patient looked as though uncomfortable, but was thought to be exaggerating his sufferings.

Course. Fever continuous, 100° to 104°; daily variation, 2° to 3°; duration in all about one month. Pulse, 72 to 96; respirations, 20 to 24.

BLOOD EXAMINATIONS.

	Hemoglobin. Per cent.	Red cells.	Leukocytes.	Index. Per cent.	Polynuclears. Per cent.	Large mononuclears. Per cent.	Small mononuclears. Per cent.	Eosinophiles. Per cent.
January 4 . . .	...	....	14,200					
January 5 . . .	80	4,200,000	10,000	1	77	7	15	1
January 8 . . .	...	....	10,000					
January 9 . . .	...	....	12,900					
January 12 . . .	...	....	17,100					
January 13 . . .	...	....	16,100					
January 16 . . .	...	....	23,100					

At the end of two weeks patient developed some swelling and tenderness in the iliolumbar region. He was transferred to the surgical side, and a perinephritic abscess of some size was evacuated. Growth from abscess showed Micrococcus pyogenes aureus. Recovered promptly. Not until the development of the local signs was it possible to make the diagnosis.

Attention is called especially to the low total leukocyte counts in the first week and the normal differential count.

Case VII.—*Abscess of the Liver.* F. S., aged thirty-five years; admitted May 6, 1904; transferred June 13, 1904.

History. Family and previous personal history of no help. Present: Began twelve days before admission with headache, malaise, and pain in the bones. Fever constant from 101° to 103°. For one week some pain on right side on deep inspiration. On admission, temperature, 100°; pulse, 96; respirations, 24. Physical examination at this time entirely negative.

Course. A continuous fever ranging from 100° to 105°; daily variation of from 2° to 3°; lasting about seven weeks before its origin was made out. Pulse, 80 to 100; respirations, 20 to 24.

Blood Examinations.

	Leukocytes.	Polynuclears. Per cent.	Large mononuclears. Per cent.	Small mononuclears. Per cent.	Basophiles. Per cent.	Eosinophiles. Per cent.	Lymphocytes. Per cent.
May 6	19,300						
May 9	18,800						
May 15	17,500						
May 18	10,400						
May 19	12,200	72.4	7.6	18.8	0.4	0.8	
May 22	15,200						
May 23	16,500						
May 25	14,200						
May 27	......	73.0	8.0	......	......	1.0	1.8
May 28	14,800						
May 30	13,600						
June 3	14,200						
June 5	14,000						

Blood culture, May 27, negative,

Urine, sputum, and feces frequently examined without result. Gradually increasing resistance in right upper quadrant of abdomen and some slight tenderness there. Patient became weaker and more anemic; was transferred to the surgical division, and operation disclosed an abscess of the liver.

In this case we note that after three fairly high counts the leukcytes sank to a rather indeterminate level and that both differential counts were normal.

CASE VIII.—*Subphrenic or Retrohepatic Abscess.* J. L., aged eighteen years; oiler; admitted November 23, 1904; transferred December 22, 1904.

History. Family and previous history of no aid. Present: He has had a cold and cough for some time. Three months ago he stopped work on account of abdominal pains, general in distribution, but most marked in umbilical region. Sometimes these pains shifted to the right side of the abdomen, especially if he slept on that side. The pains were most likely to come on after meals and were accompanied by bloating, but they also came when he was at work and interfered with his work. His appetite has been normal, his bowels very constipated. During his three months' illness he has lost twenty pounds in weight and much strength. For at least three weeks of this time he has wakened nearly every night with fever and chilly sensations. At one time his temperature reached 104° according to his physician. The pain in abdomen radiates at times to chest and shoulder (right). On admission, temperature, 99.8°; pulse, 92; respirations, 24. Physical examination at this time showed only a marked anemia; no cause for fever.

Course. Intermittent fever, from 97° to 104.8°, with frequent chills, lasting at least seven weeks before origin was found. Pulse rapid with chills, but usually 80 to 90; respirations, 20 to 30.

BLOOD EXAMINATIONS.

	Hemoglobin. Per cent.	Red cells.	Leukocytes.	Polynuclears. Per cent.	Large mononuclears. Per cent.	Lymphocytes. Per cent.	Basophiles. Per cent.
November 21	90	....	13,400				
November 25	...	....	13,300				
November 28	70	3,901,000	11,000				
December 2	...	....	10,600	61	10	26	
December 5	...	....	18,000				
December 6	...	....	16,000	72	9	18	1
December 8	...	....	14,300				
December 10	...	....	14,600				
December 11	...	....	16,500				
December 16	...	....	9,100				
December 17	...	....	9,600				

The patient gradually became weaker and more anemic. To careful observation there seemed some slight enlargement of the right side in region of liver. There was occasionally a moderate epigastric tenderness, but the signs were so slight and variable that it seemed not wise to attach too great weight to them.

At one time, on account of cough, expectoration of mucus, and a few localized rales, it was thought that he must have pulmonary tuberculosis. We were, however, finally convinced that the trouble lay in the region of the liver. He was transferred and operated upon, an abscess being found posterior to and involving the right lobe of the liver. The patient finally died of exhaustion resulting from profuse hemorrhage from the liver wounds. Cultures from abscess yielded Staphylococcus pyogenes albus.

Again we see that in the case of a suppurative inflammation the leukocyte count only once in eleven times rose to a level regarded as suggestive of pus. One of the two differential counts suggested tuberculosis, the other was normal. In the early weeks of observation in the hospital tuberculosis seemed the most probable diagnosis. The gradual enlargement of the right side of the thorax, the marked anemia, rather frequent chills, and sweating ultimately led to a correct diagnosis.

CASE IX.—*Empyema.* F. D., aged four years; admitted October 25, 1907.

History. Family: Negative. Previous: Pneumonia two years ago and in January, 1907. Dry cough since. Attack of pain in right lower quadrant abdomen lasting one week in May, 1907. Present: Fever and pain in abdomen since October 6. Occasional vomiting and cough. Pain agonizing at times. Chills repeated. On admission, temperature, 103°; pulse, 144; respirations, 40.

Examination. Anemia; emaciation; tenderness right side abdomen; bulging of right lower thorax.

Course. Fever 98° to 104°; very irregular, lasting in all over a month before the cause was found; cough; vomiting; abdominal pain.

BLOOD EXAMINATIONS.

	Hemoglobin. Per cent.	Leukocytes.
October 25	65	40,000
October 26	...	31,000
October 31	...	14,500
November 8	...	22,700

Urine, normal; sputum, no tubercle bacilli; no reaction to ophthalmotuberculin test. Operation November 9; localized collection of pus in right pleura; pleural culture, pneumococcus.

This case is reported with interest, for here the height of the leukocyte count and the course of the fever taken with the scant indication of an apparent enlargement of the right side of the thorax led to the suggestion that the boy had an empyema some time before physical signs justifying that diagnosis could be had.

Holt[3] reports a case of high temperature for three months in a boy two and one-half years of age, in whom the most careful study failed to disclose the cause of the fever. Briefly, the symptoms were fever, varying from normal to 106.2°, a little cough, slight acceleration of respiration, progressive emaciation and exhaustion, with varying signs over the lungs, never sufficient to justify the introduction of an exploring needle. At the autopsy, which was made by me, we found two small sacculated empyemas, one on the right side situated on the diaphragmatic surface of the lung near its anterior border, the other on the left side at the base of the lung and close to the spine. During the course of the fever the patient showed a leukocytosis varying from 10,500 to 28,000.

Delafield reports a similar case, the patient being a woman, whose fever lasted 234 days in all, and the empyema was found only at autopsy.

One should not leave the subject of protracted fever in children without remarking that in some instances the explanation is to be found in a suppurative pyelitis, the origin of which it may be quite impossible to explain. Difficulty in these cases arises only from failure to examine the urine. In young children especially, on acount of the difficulty of obtaining the urine, the examination is likely to be omitted. I have seen one case in a child two years of age in which fever ranging from 102° to 106° and persisting for three weeks was twice attributed by a distinguished consultant to a pneumonia which failed to appear. The examination of the urine at once showed an active pyelitis, and appropriate treatment promptly put an end to the fever. Instances of such cases running months before detection are on record.

DIFFERENTIAL DIAGNOSIS. *Malignant Endocarditis.* In its typical form malignant endocarditis is easily recognized. The cardiac disturbance, with presence of murmurs, the characteristic petechial rash, and the symptoms produced by the lodgement of emboli in various parts of the body make a clinical picture easily interpreted. In some cases, however, the cardiac symptoms are so slight as to be easily overlooked or undervalued, the rash and the embolic phenomena are absent for long periods of time, and the patient shows only an irregular fever, accompanied by increasing anemia and prostration. If limited to the interpretation of the clinical symptoms, we may well find it impossible to reach a definite diagnosis in such cases. But blood cultures will, as a rule, promptly clear up the mystery. A simple culture may fail, but a second or third will almost surely detect the offending organism.

Of recent years we have had an unusual number of cases of malignant endocarditis in the wards of the Presbyterian Hospital, and the blood cultures have been regularly successful. With relation to the cases here reported, attention is called to the following points:

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[3] Archives of Pediatrics, January, 1902, p. 22.

1. The absence of an indication, either in the history or in the body of the patient, of the source of infection.
2. The very irregular type of fever and the long periods of comparative freedom from fever.
3. The marked anemia, progressive and accompanied by progressive emaciation.
4. The low leukocyte counts, although the blood may contain many pyogenic organisms.
5. The typical petechial eruption is of the greatest value in diagnosis. This eruption will often be found in the palpebral conjunctiva (lower lid); in some instances when it cannot be found elsewhere (Janeway).
6. The chronicity of the disease, six to nine months in some cases.

Localized Abscesses or Suppurations. In these cases the chief symptoms are those found also in malignant endocarditis: (1) Fever, very irregular in type; sometimes repeated chills and sweating. (2) Progressive anemia and emaciation. (3) Absence of any indication of the source of infection for weeks or months.

Blood cultures are, however, negative, and we may for long periods be quite unable to reach a satisfactory diagnosis, until at length the characteristic signs of a local suppuration or abscess develop. The duration of this period in these cases is quite striking. The empyema patient was under observation for a month, the perinephritic abscess gave a history of three and one half months, the retrohepatic abscess of four months. Holt's patient was under observation for three months, and then the local collections of pus were found at autopsy. In Delafield's case 234 days of fever were recorded and again the explanation was found only at the autopsy.

The diagnosis presents the very greatest difficulties. Unless we may rely upon von Pirquet's cutaneous- or Calmette's ophthalmic-tuberculin test, we have at present no reliable means of differentiating these cases from those of miliary tuberculosis. In one of the series quoted the leukocyte count was high enough (40,000, 31,000, and 23,000) to point clearly to a suppurative process, but in none of the others were the counts of definite value. The differential counts upon which so much emphasis has of late been laid as a symptom of pus in certain localities are so variable that it is quite impossible to interpret them. We must in these cases rely upon unremitting vigilance for the detection of the signs of a definite abscess or suppuration.

4. INFLUENZA. From time to time during the season when influenza is prevalent in the city we see cases of continued fever in which the best explanation of the fever is the presence of an influenzal infection without local lesion. The following cases illustrate this type of fever fairly well, though both are relatively

brief. In private practice it is not very unusual to meet such cases running for a month or more:

CASE X.—Miss S., aged thirty years; admitted February 16, 1906; discharged, well, March 18, 1906.

February 16. Entirely well until night. She had some muscular pain during night, and at 3 A.M. a hard shaking chill, followed by headache and severe muscular pains. No cough or expectoration. Physical examination entirely negative. Leukocytes, 11,500; temperature, 103° to 104°; pulse, 110 to 120; respirations, 26.

February 17. Leukocytes 12,700. Pain in head and neck.

February 19. Temperature has been gradually falling, and is now normal.

February 23. Yesterday, without discoverable cause, temperature rose again to 102°, and the patient again complained of headache and general soreness. Physical examination negative. Leukocytes, 15,300.

February 28. Another relapse, with fever 101°, general malaise, and soreness. A differential blood count is found normal. No malarial organisms.

March 7. After four days of normal temperature patient again has had a return of fever (102°) and all her previous symptoms. Leukocytes, 15,000.

March 18. Since last note temperature has remained normal and patient has made a rapid recovery.

CASE XI.—A. McV., twenty-three years; bricklayer; admitted April 8, 1906; discharged, well, April 27, 1906.

April 3. Moderate frontal headache, anorexia, constipation, general soreness, prostration, cough, with mucous expectoration.

April 5. Severe epistaxis. Pain in shoulders and knees.

April 6. Severe epistaxis. Chilly feelings, profuse sweats, pain in right chest.

April 8. Fever reached 104°.

April 9. Admitted to Hospital. Face flushed, tongue clean, looking sick, but physical examination showed nothing more. Temperature, 103.8°; pulse, 92; respirations, 24.

April 11. Feeling better. Some general soreness still. Cough, with free mucous expectoration. Temperature, 99° to 103.3.°

April 13. A small area of consolidation found in right middle lobe. Temperature, 101° to 103°.

April 15. After remission for forty-eight hours temperature rose suddenly to 102.5°. Pharynx congested. Inguinal glands swollen. No cause found for increase in fever.

April 16. Second sudden shoot of temperature to 103.5°. No cause found.

April 27. Temperature remained normal after last note, and patient made a rapid recovery.

The recognition of these cases is not, as a rule, difficult. They belong to the winter season, when influenza is prevalent. They begin suddenly, usually with the characteristic symptoms, headache, general muscular soreness and pain, and prostration. They may have a cough and expectoration, and in the sputum the influenza bacillus may be found in large numbers.

It is now well understood that the presence of the influenza bacillus is not a frequent happening in the affection clinically known as influenza. The great majority of such cases do not show the influenza bacillus, but show pneumococci, streptococci, or staphylococci in large numbers in the sputum, if there is expectoration. Of course, also, many of the patients have no cough or expectoration. When, however, the organism can be found in the sputum in large numbers, the finding is of significance. The most characteristic feature of these cases is the exceeding irregularity of the temperature curve, as indicated in both these cases. The fever comes and goes in a most unaccountable manner. It is to be understood that in these cases the most careful watch must be kept to exclude the presence of complications which would explain the sudden rise and fall of the fever, such as acute otitis, mastoiditis, or involvement of the antrum or accessory sinuses. We must also recognize the fact that the fever may come and go independently of such complications. Regularly with the return or increase of the fever there is return or increase in the clinical symptoms. These patients regularly recover. In protracted cases outside of the hospital we often find that the best thing to be done for such patients is to get them out of the city.

The blood examinations in these cases have only moderate value; usually they show a slight or moderate leukocytosis ranging from 10,000 to 20,000. The differential counts, as in Case II, are all normal. Blood cultures are negative.

5. UNEXPLAINED FEVER. The history of this patient is as follows:

CASE XII.—M. S. G., aged thirty years; admitted May 10, 1907; discharged January, 1908.

History. Family: Negative. Personal: Born in Scotland; in Honolulu four years; in Trinidad one year. Menstrual: Amenorrhœa fifteen months. Previous: Measles, typhoid, dengue, tuberculosis three years ago, tonsillectomy, appendicectomy. Present: Cough, expectoration, constipation, nausea and vomiting, headache, syncope, increasing weakness. Abdominal pain and fever from January to admission.

Physical Examination. Negative except for a slight tenderness of left lower quadrant of abdomen.

From May 10 to June 1 the patient did well. She had one or two temporary rises of fever, but most of the time the temperature was within normal limits. All her symptoms cleared up, and except for constipation she felt well. From June to October she ran a continued fever of varying degree, for some days ranging from 100°

to 101°, but most of the time higher—101,° 102°, and 103°. There was an ebb and flow very suggestive of typhoid fever in the weekly curves, but none of the characteristic signs developed. There was almost constant leukocytosis, as the appended table will show, no Widal reaction, and negative blood cultures. The only suggestive thing about the physical examination was persistent tenderness over the left half of the abdomen, especially in the region of the left kidney. The urine was normal; an uncontaminated specimen was obtained and found sterile. The fever, leukocytosis, and persistent pain suggested a local suppuration, but the signs did not develop, and, the patient's condition remaining good, action was deferred. Finally, in the first week of October the fever gradually rose, and on the 10th reached 105°. With this rise there was a distinct increase in the local tenderness and pain, and an exploratory operation seemed demanded. This was done by Dr. McCosh, and a most thorough examination of the abdomen disclosed nothing abnormal whatever. Lest by any chance a minute focus in the kidney should be overlooked, the kidney was exposed through a lumbar incision and carefully examined. No lesion was found. The wounds were then sutured and the patient returned to the ward. The temperature at once fell, and within three days became normal and so continued. The patient rapidly regained her strength, and in a few weeks left the hospital quite well.

BLOOD EXAMINATIONS.

	Hemoglobin. Per cent.	Red cells.	White cells.	Polynuclears. Per cent.	Transitionals. Per cent.	Large mononuclears. Per cent.	Small mononuclears Per cent.	Basophiles. Per cent.	Eosinophiles. Per cent.
May 10 . . .	70	5,600,000	15,100	76	3.5	10 5	8.3	0.8	1.0
June 9 . . .	---	....	23,800						
June 10 . . .	---	....	25,000						
June 24 . . .	---	....	15,300						
July 27 . . .	---	....	23,000						
July 31 . . .	---	....	16,300						
August 2 . . .	---	....	18,900	81	6.0	2.7	7.3		
August 12 . .	---	....	13,000						
August 13 . .	---	....	12,100						
August 22 . .	---	....	10,000						
October 1 . .	70	4,500,000	25,000	90	1.0	6.0	8.0	0.25	0.25
October 4 . .	---	....	17,000	76	1.0	2.0	20.0	......	1.0
October 9 . .	---	....	16,800						
October 10* . .									
October 29 . .	---	....	15,000						

* Operation.

For this case we have at present no satisfactory explanation. The symptoms, the blood counts (the high percentage of polynuclears), and the course of the affection indicated the presence of some purulent focus. No such focus was found, yet the patient promptly recovered after operation. There was no suggestion of hysteria in the patient. Mentally she was entirely normal. Theoretically it may be possible that a minute focus of suppuration did exist in some part of the abdomen and that the circulatory changes induced by the operation brought about its cure, in some such way as laparotomy cures tubercular peritonitis; or possibly a minute focus was evacuated without detection.

Practically the case illustrates the fact that there are seen from time to time cases of protracted fever which cannot at present be satisfactorily classified.

SUMMARY. 1. Malarial fever is easily recognized by the presence of the characteristic microörganisms in the blood, and by its amenability to quinine. Fevers not conforming to these requirements are not malarial.

2. Typhoid fever can be recognized or excluded with equal accuracy by the combination of clinical and laboratory evidence.

3. Tuberculosis and sepsis of certain types present clinical pictures so closely similar that they can often only be differentiated by the ultimate outcome of the case, possibly only by autopsy.

4. Influenza may give rise to protracted fever, which can usually be easily recognized from the condition under which it occurs, sudden onset, characteristic symptoms, and course.

5. Sepsis in other cases may be clearly indicated by very high leukocyte counts, with high polynuclear percentages, before any localization of the process can be made.

6. Blood cultures are of very great value in the differentiation of fevers, especially in typhoid fever, and in such conditions as malignant endocarditis.

7. There are cases of long protracted fever which cannot at present be satisfactorily classified.

CERTAIN COMPLICATIONS OF PNEUMONIA.

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IN this paper I purpose dealing only with certain complications of pneumonia, some common, others rare, which have come under my notice, and of emphasizing certain lessons they have taught me. The first and most important lesson, which all the cases have forced upon me, is the well-known fact that pneumonia is a constitutional